

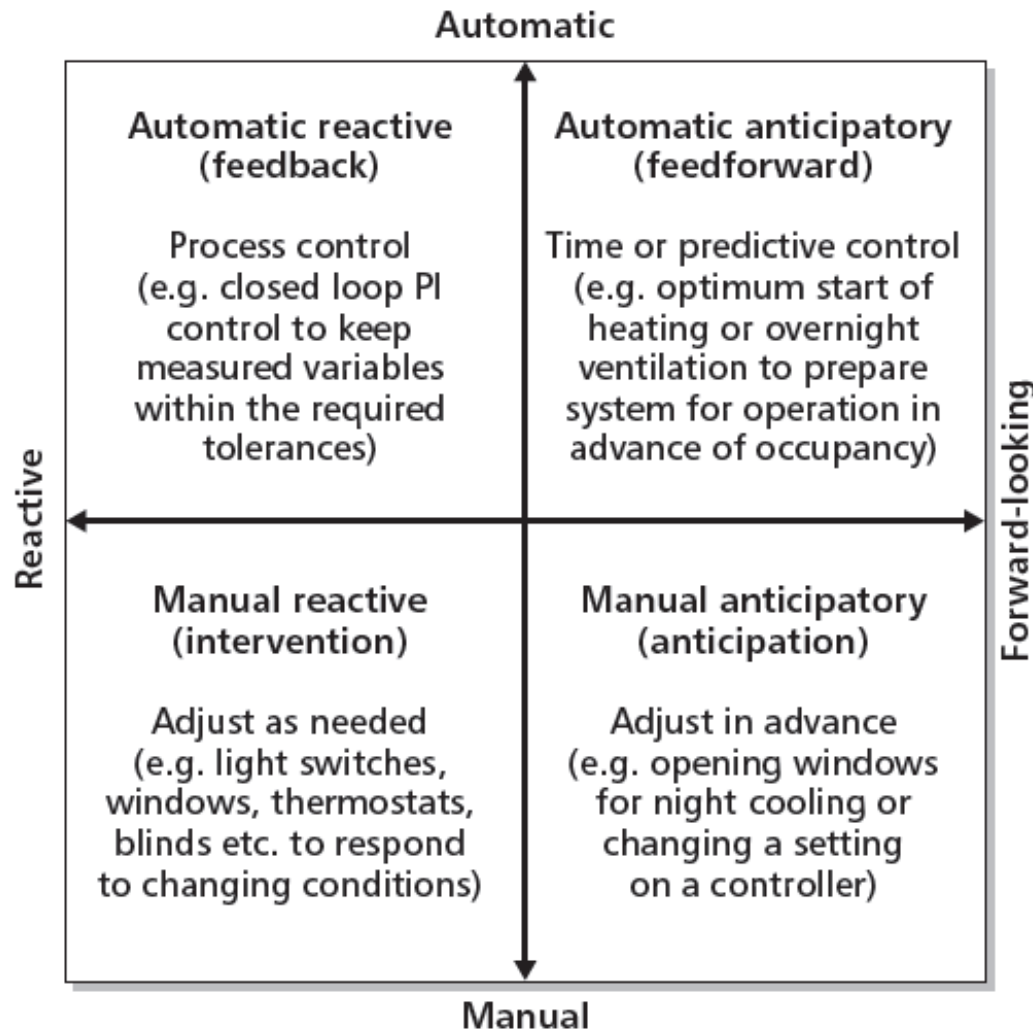
Controls for building services

Why do we need CONTROLS?

“The fundamental purpose of building engineering services controls, whether automatic or manual, is to regulate the performance of systems to meet operational and environmental requirements, in accordance with the design intent.”

Source: CIBSE Guide M

Or more simply to maintain comfort conditions with minimum energy demand.



Source: CIBSE Guide F

Figure 6.1 Strategic features of controls

MANUAL v. AUTOMATIC

Form two groups to make a case for:

Group 1 - manual in preference to automatic controls

Group 2 - automatic in preference to manual controls

Give examples of applications of where you believe your system is superior

MAIN FUNCTIONS OF A CONTROL SYSTEM

1. To switch equipment on and off
2. To adjust the output of equipment to maintain the required operating conditions
3. To provide monitoring and metering functions

CONTROL AND CONTROL SYSTEMS

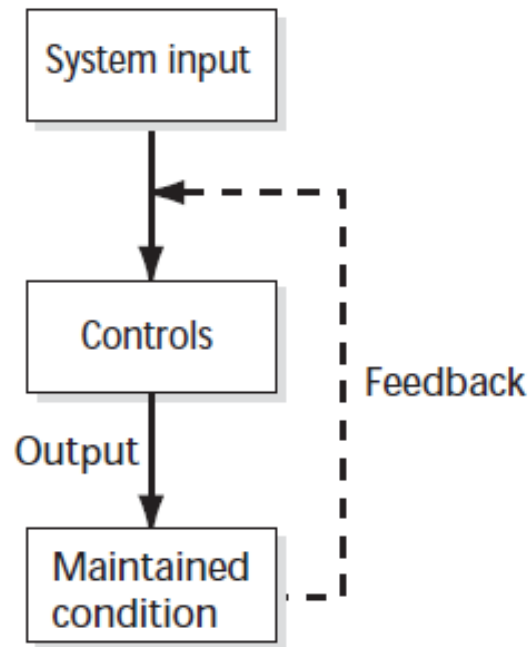


Figure 7.1 The principle of controls

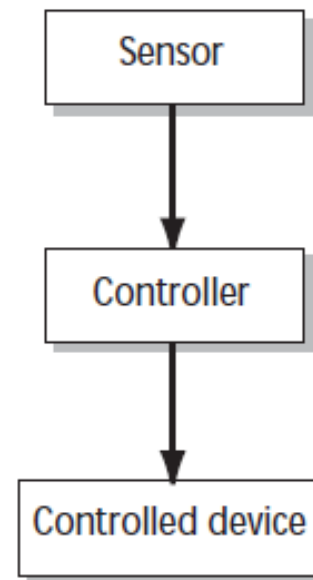


Figure 7.2 Schematic of a basic control system

BASIC HEATING CONTROLS

- Time controls
- Temperature controls
- Boiler controls
- Zone controls

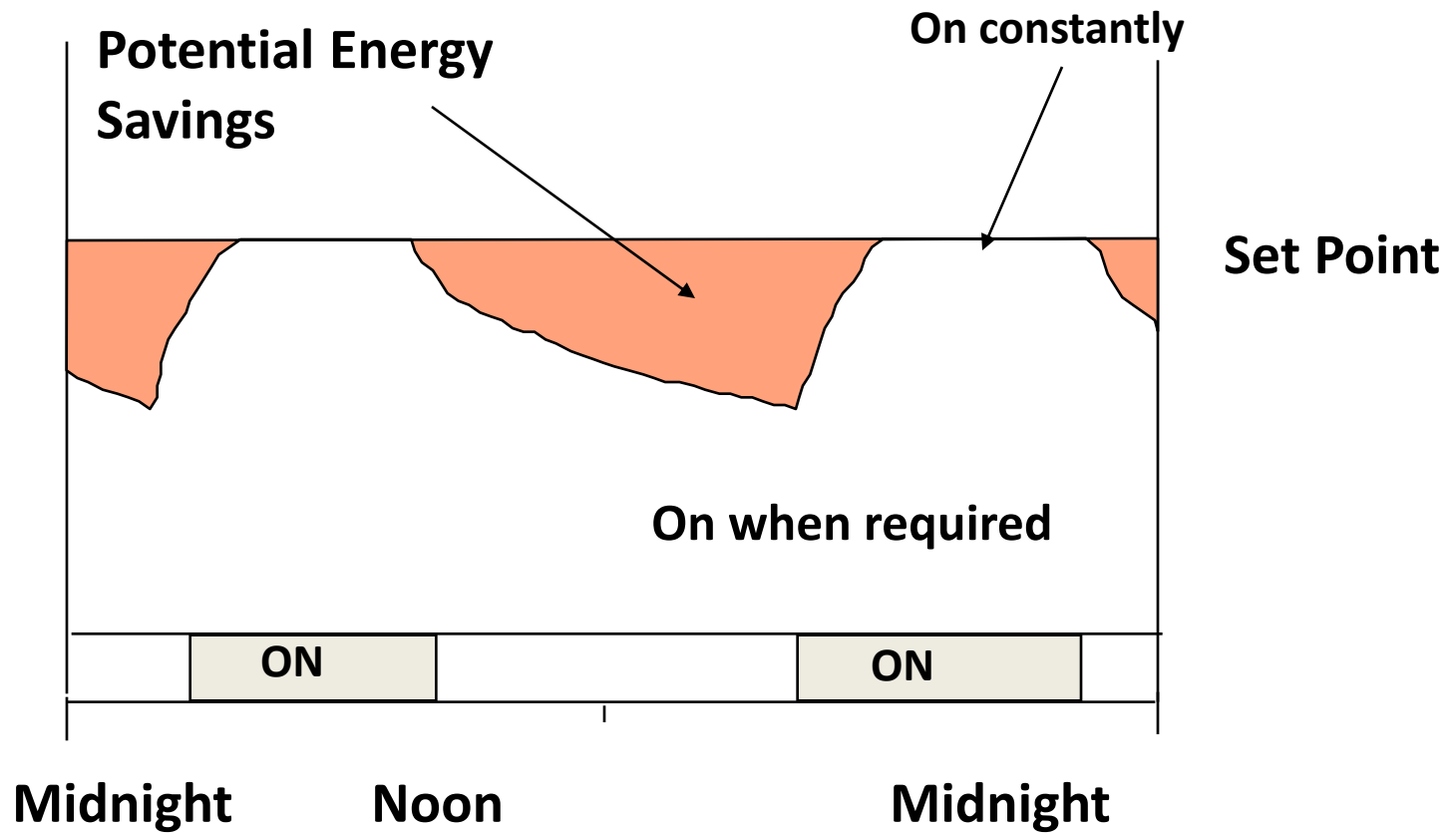
LOCAL TIME CONTROL



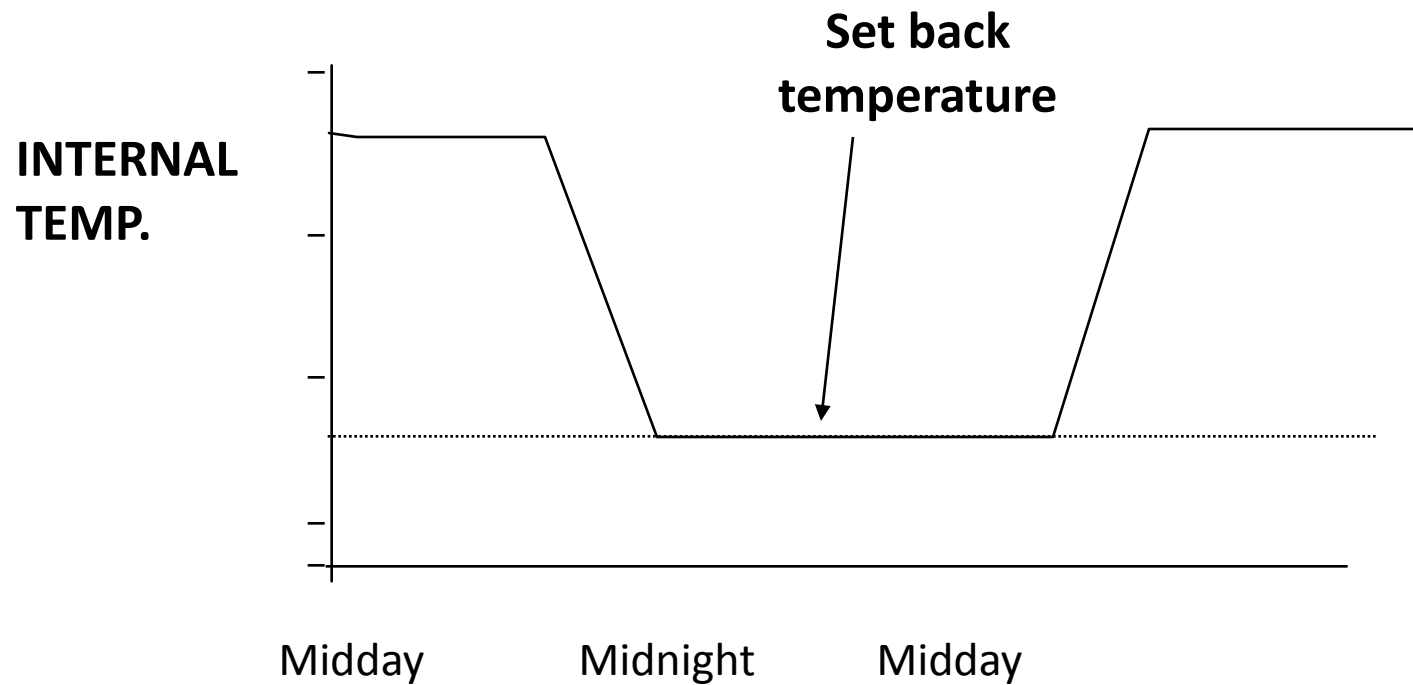
Either in the form of a simple time clock or a more detailed programmer.

Both form the function of ensuring that individual zones are controlled only when required.

FIXED TIME CONTROLS



NIGHT SETBACK



ZONE CONTROL

Independent control of areas or applications with differing requirements can greatly reduce energy requirements.

Criteria for zoning can include differences in:

- Occupancy hours
- Space temperature requirements
- Heat/loss gains
- Heating system type
- ?

LOCAL TEMPERATURE CONTROL



A simple switch that can be adjusted to switch on or off at a pre-set temperature. Senses air temperature and is usually a bimetallic strip or bellows arrangement.

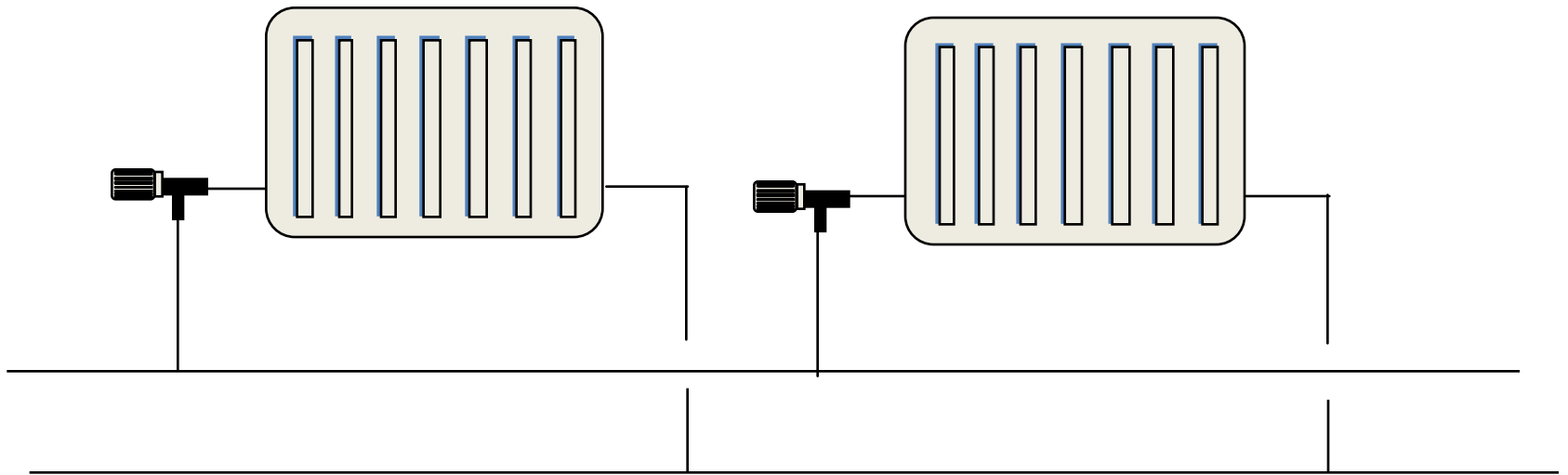
LOCAL TEMPERATURE AND TIME CONTROL

Has all the functions of a room thermostat but also can be set to different temperatures at different times of the day.

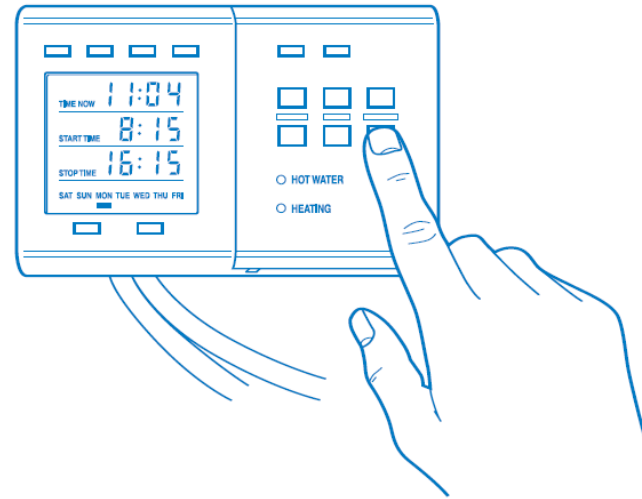


TEMPERATURE ZONE CONTROL

- TRVs



MULTIPLE ZONE TEMPERATURE AND TIME CONTROL



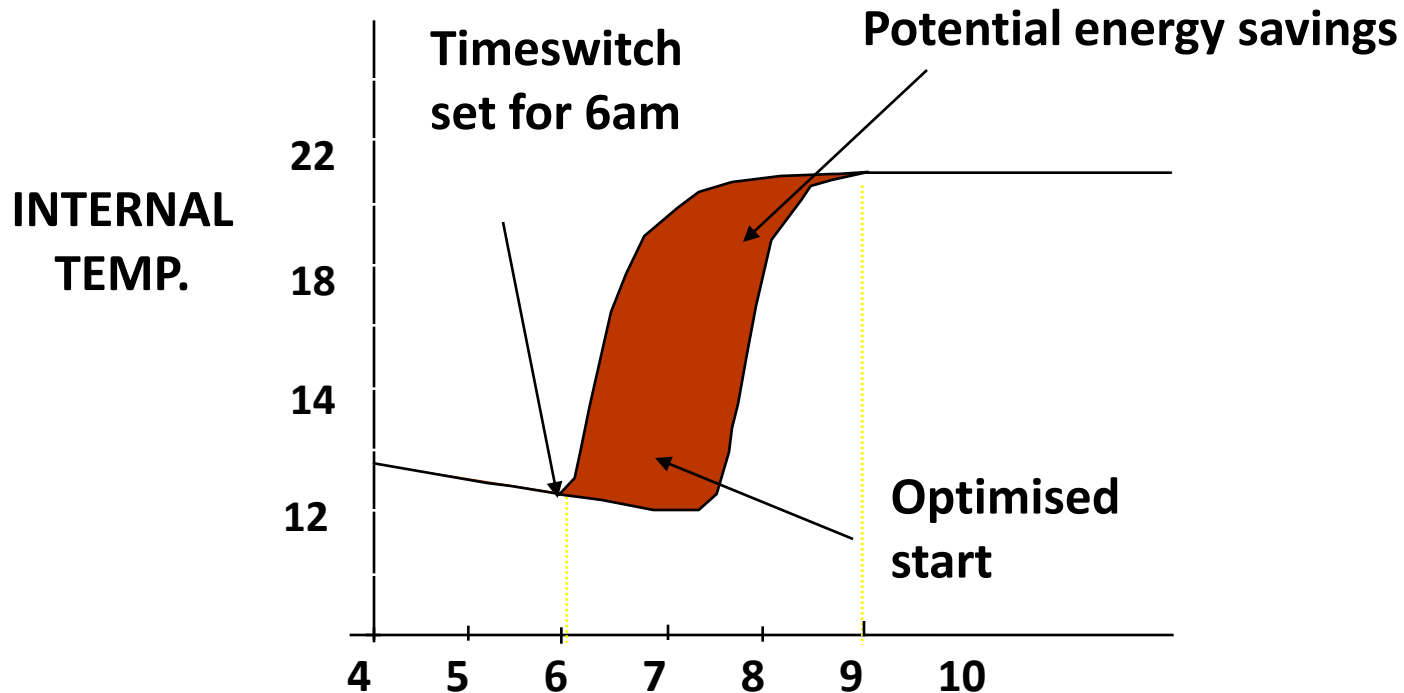
Usually offer 24 hour or 7 day programming with up to three on periods per day which can be set independently for heating and hot water.

BOILER OPTIMISATION

By monitoring inside and outside temperature an optimiser will delay start so that the building is not brought to temperature before the occupancy time. An optimiser should be self learning.



OPTIMUM START CONTROLS



MATCHING HEATING (AND COOLING) SYSTEM OUTPUT TO DEMAND

Output is varied by either:

- Adjusting flow rate of heat transfer media by restricting or diverting flow
- Adjusting temperature of heat transfer media often by mixing or by inhibiting heat (or cooling) source

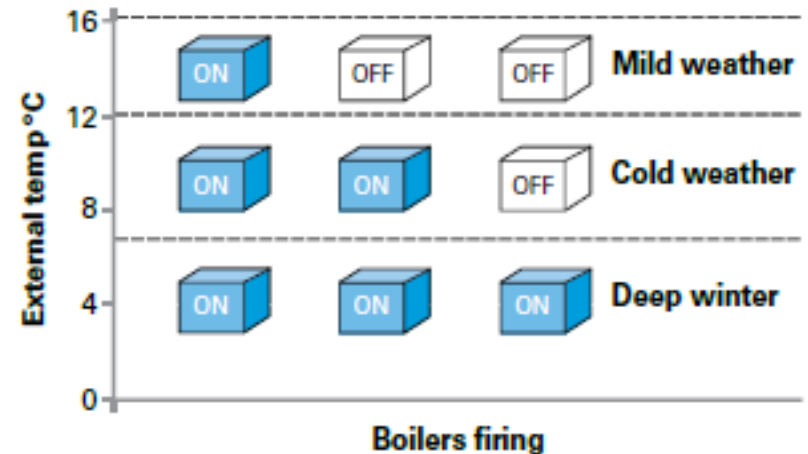
SEQUENCING CONTROL

If two or more boilers are installed sequence control should be used.

Good sequence control avoids “cycling” and improves boiler efficiency.

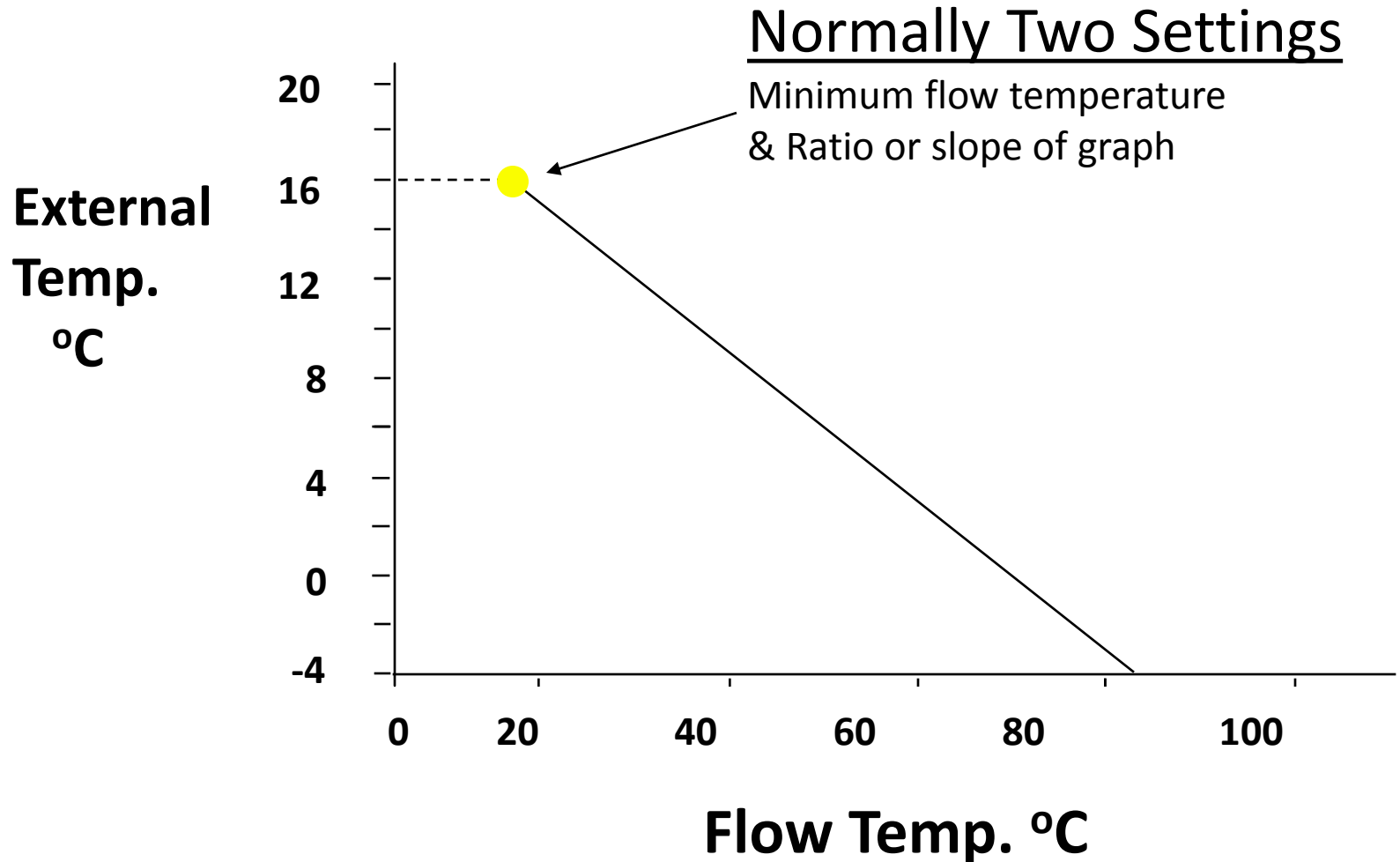
The sequence should be varied so that boilers are all used and wear equally.

An illustration of boiler sequence control



Source: Carbon Trust CTG 065 Heating Controls

WEATHER COMPENSATION



WEATHER COMPENSATION



Automatically matches boiler output (water flow temperature) to the external temperature for fuel savings.

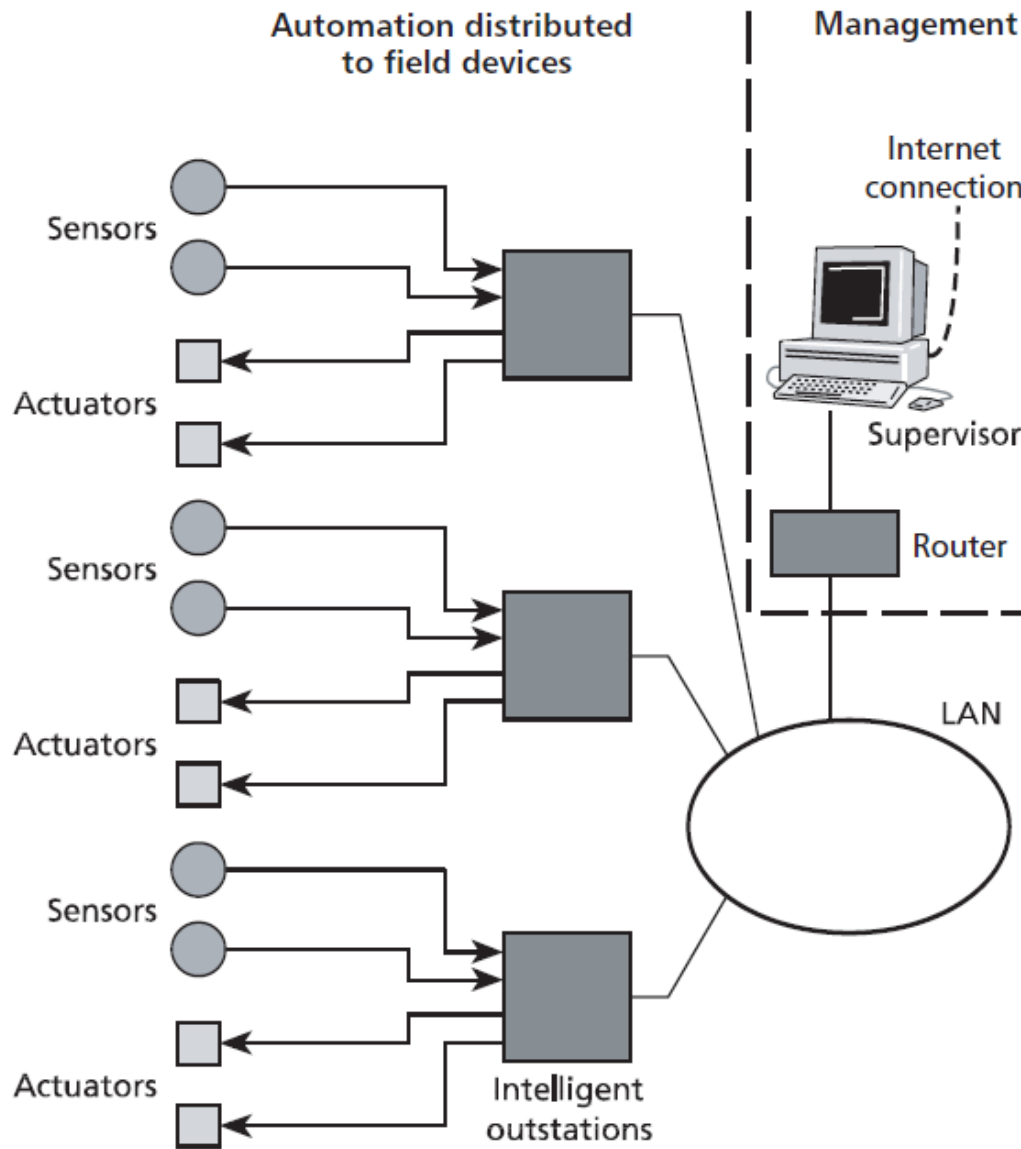
Often integral to the boiler (look for interface)

BUILDING MANAGEMENT SYSTEMS

“A building management system (BMS) is a control system which performs the overall control and monitoring functions for some or all the building’s plant and systems,...”

Source: CIBSE Guide M

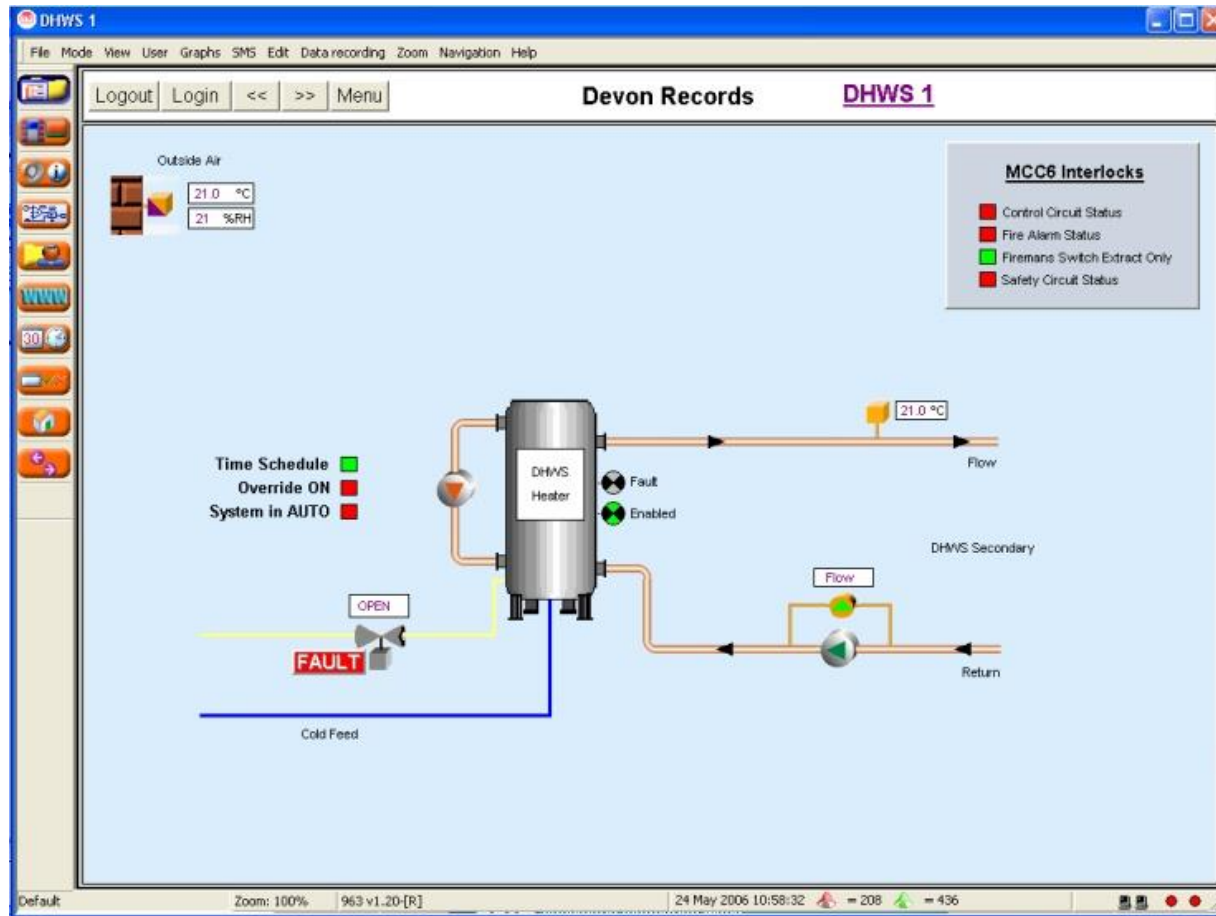
BMS Architecture



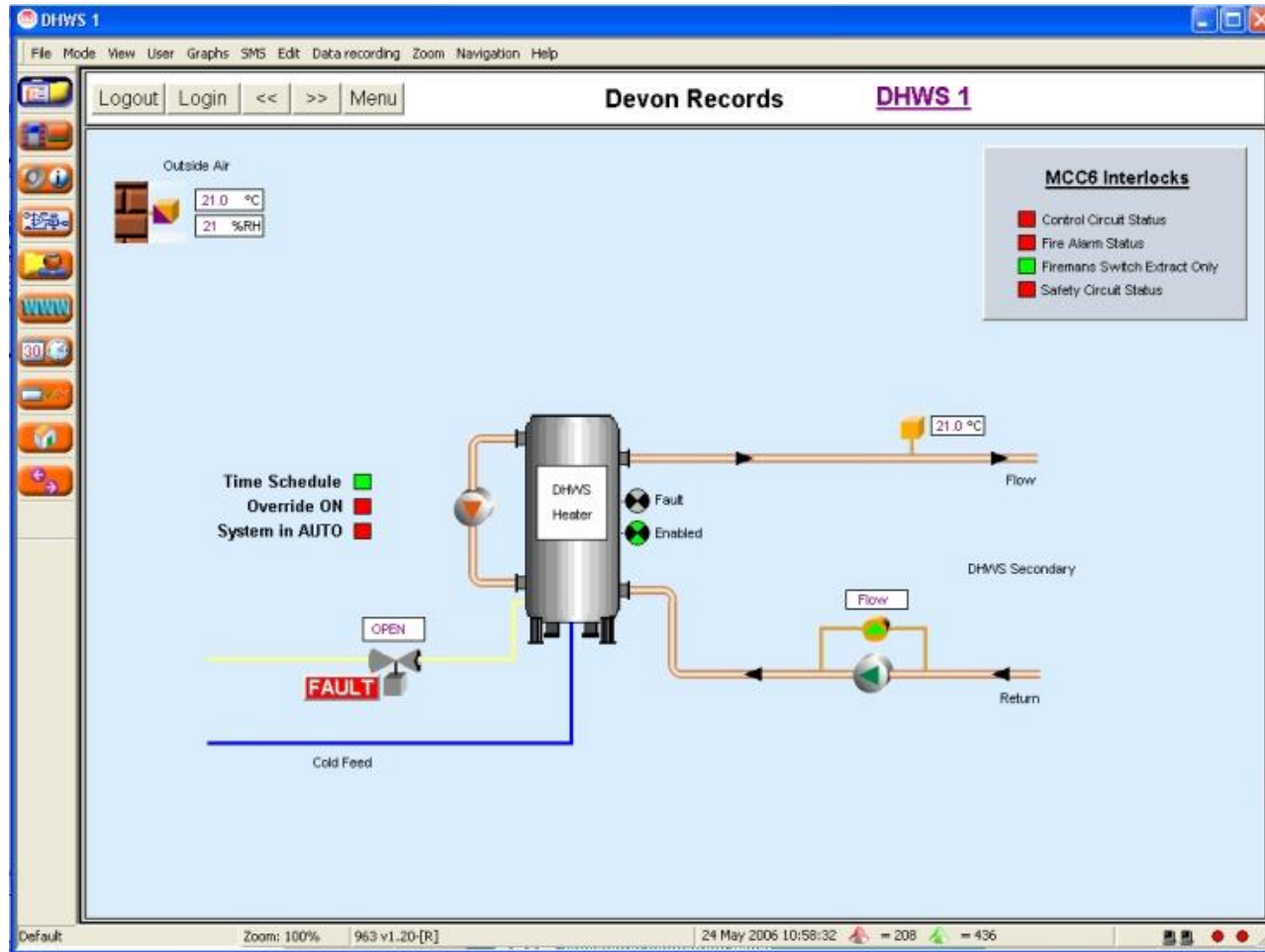
Source: CIBSE Guide H

Figure 4.5 Two-level architecture BMS with direct routing using Ethernet TCP/IP protocol

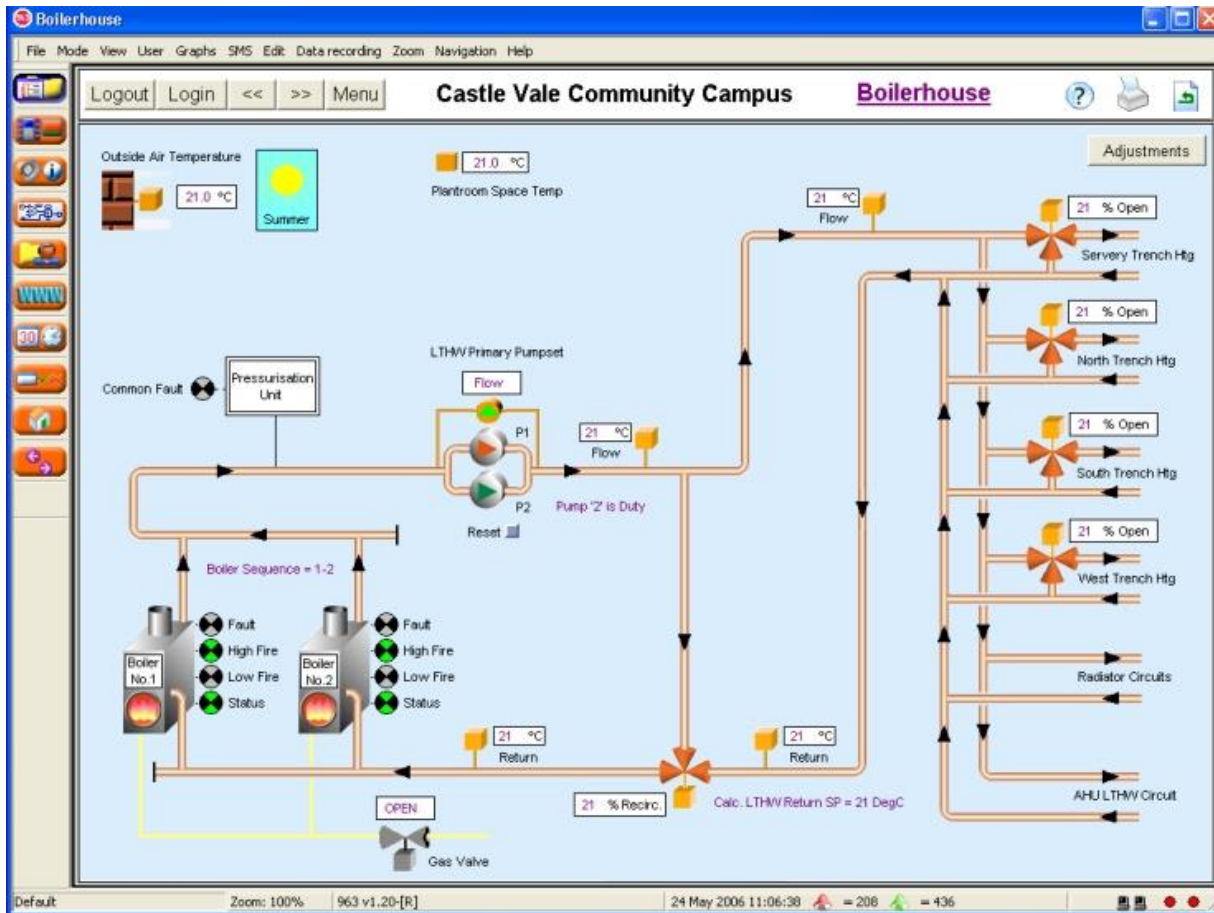
BMS - Screenshots



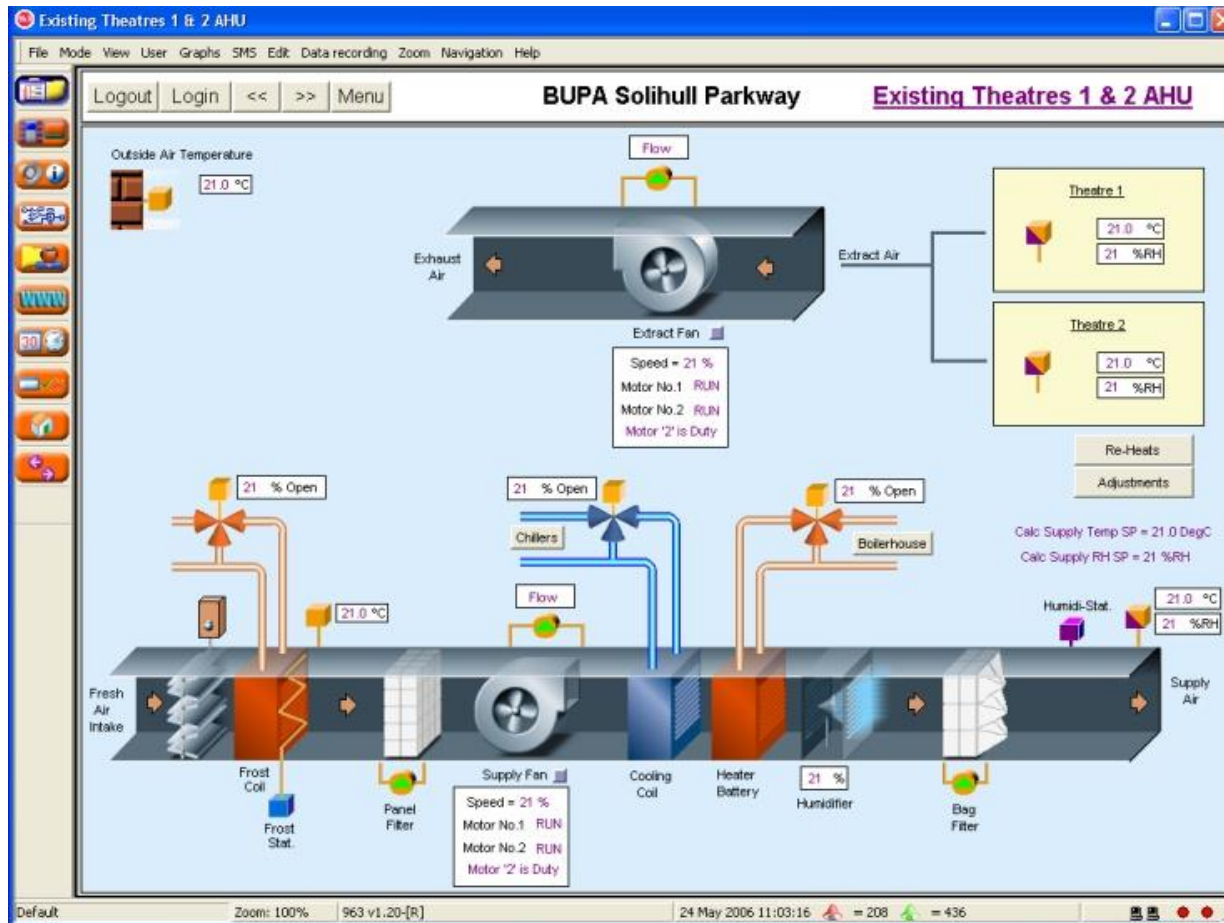
Group Exercise



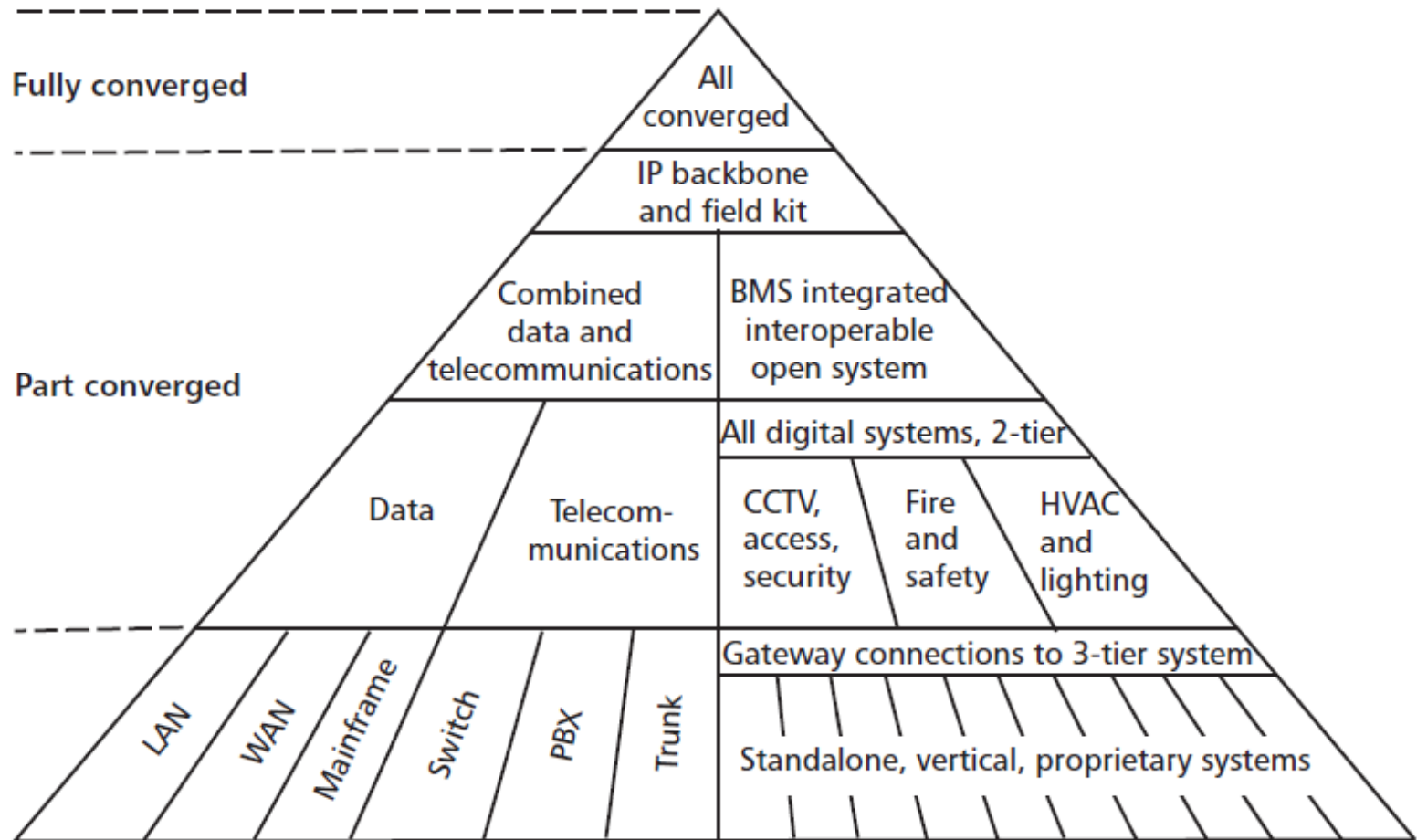
BMS - Screenshots



BMS - Screenshots



CONTROLS AND IT INTEGRATION



Further Reading

- CIBSE Guide M – Chapter 7: Controls for building services